

REMARKS

Claims 20-47 are pending in this application and have not been amended in this Request. All of the claims have been rejected.

35 U.S.C. §102: Higgins

The Office has rejected claims 24, 26-28, 32-34, 38-41, and 45-47 under 35 U.S.C. §102(b) over Higgins (U.S. Patent No. 6,294,405). Applicant respectfully traverses this rejection.

1. The Office has repeatedly rejected claims 24, 26-28, 32-34, and 38-41 as being “clearly anticipated” by Higgins. The Office has noted that

[r]egarding the bump being directly on the RDL, it would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same function as before involves only routine skill in the art. *In re Karlson*, 136 USPQ 1234.

*See Office Action at page 6, 7, 8, and 9.* By arguing that the skilled artisan would have been motivated to modify Higgins in the proposed manner to arrive at the claimed invention, the Office simultaneously admits that Higgins does not teach each and every limitation in the rejected claims. As such, the Office can not substantiate that Higgins anticipates these rejected claims since it admits that Higgins does not teach each and every limitation in these rejected claims. *See M.P.E.P. § 2131.*

2. As to claims 41 and 45-47, the Office argues the device of Figure 1 of Higgins provides a stud bump (20) on the portion of the RDL pattern not covered by the insulating layer. But the solder bumps (20) are not formed on the RDL pattern. The device in Figure 1 depicts

that solder bumps 20 that are clearly located on UBM pads 15 and on the ends of layer 16. And the text accompanying Figure 1 describes that the redistribution traces (layer) 16 terminate at under bump metallization (UBM) pads 15 and that solder bumps 20 are formed respectively on the UBM pads. *See column 1, lines 44-49.* Thus, the skilled artisan would have understood from Figure 1 and its accompanying text that the solder bumps 20 are formed on UBM pads, and not directly on the RDL traces.

Thus, the Office has not shown that Higgins teaches or suggests each and every limitation in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

35 U.S.C. §102: Higgins & Chakravorty

The Office has rejected claim 48 under 35 U.S.C. §102(b) over Higgins in view of Chakravorty (U.S. Patent No. 6, 350,668) for the reasons listed on pages 16-17. Applicant respectfully traverses this rejection.

The Office argues that claim 48 is “clearly anticipated” by Higgins. The Office noted that

[r]egarding the bump being directly on the RDL, it would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same function as before involves only routine skill in the art. *In re Karlson*, 136 USPQ 1234.

*See Office Action at page 16.* By arguing that the skilled artisan would have been motivated to modify Higgins in the proposed manner to arrive at the claimed invention, the Office admits that Higgins does not teach each and every limitation in the rejected claims. Such a conclusion is supported by the Office’s statement that Higgins also “fails to teach the method further

comprising providing a solder ball on the study bump” (and so turns to the disclosure Chakravorty). *See Office Action at page 16.*

As such, the Office has not substantiated a proper case of anticipation of these rejected claims since it has not shown that Higgins alone teaches each and every limitation in this rejected claim. *See M.P.E.P. § 2131.* Further, the Office has not even alleged that Chakravorty alone teaches each and every limitation in this rejected claim.

35 U.S.C. §103: Higgins

The Office has rejected claims 20, 22, and 23 under 35 U.S.C. §103 as being unpatentable over Higgins. Applicant respectfully traverses this rejection.

The Office recognizes that Higgins fails to disclose the absence of a UBM pads under the stud bumps. The Office argues, however, that eliminating the UBM pads 15 in the Figure 1 device would have been obvious because it has been held that omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art.

Such an argument incorrectly interprets this legal theory. The Office’s internal guidelines recognize this theory, but not as stated by the Examiner. The Office’s guidelines recognize that omission of an element and its function would be obvious, but provided that the function of the element is not desired. But omission of an element with retention of the element’s function is an indication of non-obviousness. *See M.P.E.P. §2144.04(II).*

The Office has only argued that the invention of Higgins would still operate without the UBM pad and would not make the invention of Higgins inoperable. But the Office has ignored

the question of whether the function of the UBM pad would have been desired by the skilled artisan in light of Higgins. So to establish a *prima facie* case of obviousness, the Office needs to substantiate that the skilled artisan would have not wanted the function of the UBM pad in the device of Higgins.

Thus, the Office has not shown that Higgins suggests each and every limitation in the rejected claims to the skilled artisan. Accordingly, Applicant requests withdrawal of this ground of rejection.

35 U.S.C. §103: Higgins & Chakravorty

The Office has rejected claims 21, 25, 29-31, 35-37, and 42-44 under 35 U.S.C. §103 as being unpatentable over Higgins in view of Chakravorty. Applicant respectfully traverses this rejection.

Some of the rejected claims contain a first limitation that there exists no under bump metal under the stud bump. And other of the rejected claims recite a second limitation that the stud bump is provided on portion of the RDL pattern not covered by the insulating layer without using an under bump metal. The Office has not shown that Higgins teaches or discloses these limitations in the claims as detailed above. And the Office has not argued—much less alleged—that Chakravorty teaches or suggests these limitations. Thus, since neither reference alone teaches or suggests these limitations, it would be difficult for the Office to even argue that the combined teachings suggest these limitations.

Applicant previously argued that it would not been obvious to combine the references in the manner proposed by the Office for two reasons. The first reason is that the teachings of the

two references are not equivalent. The second reason is that modifying Higgins in the proposed manner would have made it unsatisfactory for its intended purpose of providing an improved interconnection reliability and a decreased footprint.

The Office did not find these two arguments persuasive. The Office contends that the rejection considers that the ball of Chakravorty would be placed directly on bump (20) before the substrate (50) would be attached. In other words, the Office proposes to modify the Figure 1 device of Higgins by placing the solder balls (313) of Chakravorty on the stud bumps 20 and then placing the structure 50 of Higgins on the solder balls (313), thereby locating the solder balls (313) between the stud bumps (20) and the bond pads (52).

In light of this clarification, Applicant continues to disagree that the Office has substantiated a *prima facie* case of obviousness. Why would the skilled artisan add a solder ball (314) on the stud bump and then add the structure 50 on top of that solder ball (314)? At best, all that would have been accomplished with this proposed modification is to increase the complexity (and cost) of the process, not too mention increasing the thickness of the combined structure by the added thickness of the solder ball (313). At worst, making the proposed modification would have decreased the operability of the Higgins device.

Indeed, the skilled artisan would have had no reason place a solder ball (313) in that location. The skilled artisan would have known that solder balls (313) were used to serve as a connection to a circuit board. Thus, the skilled artisan would have had no reason to place a solder ball as a connection between semiconductor device (11) and structure (50) in the Figure 1 device of Higgins.

Thus, the Office has not shown that the combination of the cited references teaches or suggests each and every limitation in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

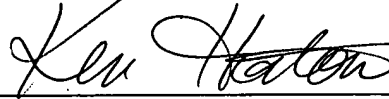
CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests the Office to withdraw the above grounds of rejection and allow the pending claims.

If there is any fee due in connection with the filing of this Request, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

By



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